

## **Comparison of Exhaust Emissions of Vehicles for Garbage Collection and Tankers for Streets Cleaning Using Diesel and Biodiesel**

**Dr. José María López, Polytechnic University of Madrid, Spain**

Dr Felipe Jiménez, Polytechnic University of Madrid, Spain

Dr Francisco Aparicio, Polytechnic University of Madrid, Spain

Mrs Nuria Flores, Polytechnic University of Madrid, Spain

When selecting new vehicles for fleets of vehicles for garbage collection and city cleaning, reduction of exhaust emissions is one of the most relevant factor to take into account. In this regard, apart from the vehicle, fuel choice is also important, considering that the same vehicle accept both diesel and biodiesel. However, it is necessary to analyze the effects of this fleet renewal and the effectiveness of using biodiesel in stead of conventional diesel. This analysis has involved tests on test tracks and in real operating conditions. The most important drawbacks of real tests are the difficulty when comparing results and the lack of repeatability. These problems increase if tests should be carried out in different places or cities. On the other hand, tests on test tracks make us to define a set of tests that reproduces the most common situations that can be found in normal driving conditions. Furthermore, these tests should be easy to carry out by a driver in order to achieve high repeatability. For previous reasons in the project that this paper describes, speed profile was obtained for different vehicles in real working conditions. A device was developed for this data acquisition by the research team. Data was stored in a memory card and no driver action was required, so he is not aware about what the device is doing. Using these data, tests for driving in urban areas, driving along rural roads, garbage collection cycles, streets water operations, etc were defined. Exhaust emissions have been measured using the Horiba OBS 2200 onboard emission measurement system. This equipment measures CO, CO<sub>2</sub>, NO<sub>x</sub> and HC emissions and fuel consumption, and data is stored in a laptop. For particulates matter, the diesel exhaust particulate onboard analyser OPMS-04 equipment of Maha was used. Different comparisons have been carried out. Among others, present vehicles and new vehicles that are replacing old ones have been compared and different fuels were used in tests: diesel and biodiesel with different cases (B30, B50 and B100). These comparisons were possible thanks to previous tests definition. Finally, extrapolation to real operating conditions involve variable load. At this point, tests on real operating conditions provided us correcting factors for fuel emissions results that should be used in order to consider changes in the vehicle load. Furthermore, the methodology has been validated dividing the whole real tests in shorter tests and comparing the accumulated exhaust emissions that onboard equipment provides and the addition of emissions produced during theoretical tests, corrected by the previously mentioned factors.